

Celebrating Chemistry

Recycling-Chemistry Can!

CHEMISTS CELEBRATE EARTH DAY • APRIL 22ND

AMERICAN CHEMICAL SOCIETY

Recycling is a process in which new items are made from products that have been used before. Materials are collected, separated, and then treated based on their physical or chemical properties. The recycled material can be used to make more of the same or different items. Sometimes these new items, like plastic lumber, may even last longer than the original item and cost less to make.

What do you do with the aluminum soda can or the plastic juice bottle when you finish drinking from it? Do you place it in the trash, or put it in a recycling container? Putting it in a recycling container is the best choice because it saves our resources and conserves energy. Some states such as Oregon, California, and Michigan even give you money back for bottles and cans.

Energy heats our homes in winter and cools them in summer; it powers our televisions, computers, lights, refrigerators, and many other devices.

Did you know that you can power a television for three hours using the energy you save when you recycle one aluminum can?! We waste energy by throwing away materials that we can reuse or recycle instead. Things we throw away often go to a landfill, a large area of land in your community reserved just for trash, where they will sit for a very long time.

If recycling is not an option, many things can be reused instead. You can decorate a container made from a plastic that your community doesn't recycle and use it as a flowerpot or penholder. A T-shirt too stained to wear still works fine as a cleaning cloth. You can also donate your extra items and outgrown clothes to organizations that find other people who need them.

In order for recycled materials to make a difference in our communities, we have to buy the new products that are made from them. Look for the recycle symbol on the item when you are buying products like the ones listed in the chart below.

So remember the three Rs of using Earth's resources:

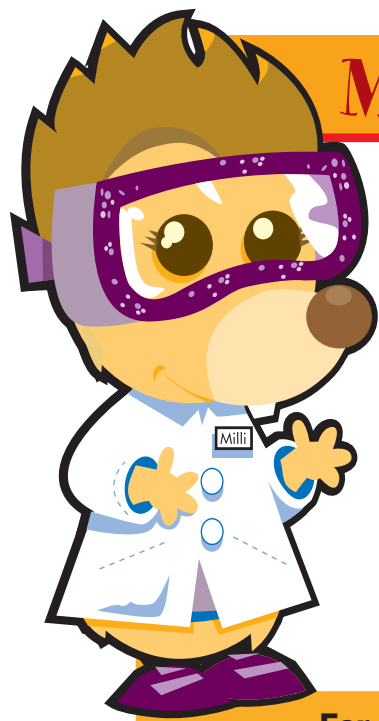
- **Reduce** – limit the amount thrown away by buying items that can be used more than once, making your own things and choosing items with less packaging.
- **Reuse** – find a new way to use something again.
- **Recycle** – collect unwanted materials and process them to make new materials.

Each "R" saves money, conserves resources, and reduces the problems of trash. In short, it is something you can do **today** to help the environment. How? Read on! In this edition of *Celebrating Chemistry*, you will learn how you can help the environment by finding new ways to use empty containers or giving items you can no longer use or need to others. Put recyclable materials into the proper recycling container and not the trash!

Look at the items listed and pictured below. A few examples have been given for how they can be reused. List at least two more ways that you could reuse each item instead of putting it in the trash. And, the next time you shop or help with your family's shopping, keep an eye out for the recycled products listed in the third column.



ORIGINAL PRODUCT	Glass bottle	Aluminum can	Milk jug	Newspaper	Plastic bag	Tire	Plastic drink bottle
REUSED AS...	Vase _____ _____ _____	Bank _____ _____ _____	Watering can, musical instrument _____ _____ _____	Paper boat _____ _____ _____	Trash can liner _____ _____ _____	Swing _____ _____ _____	Fill with colored sand and use as a doorstop _____ _____ _____
RECYCLED AS...	New bottles, "glasphalt", kitchen tiles, counter tops, and wall insulation	New aluminum cans, diecasts used by the car industry	Non-food bottles, plastic pipes, gardening products, plastic lumber and car parts	Grocery bags, notebook paper, envelopes, other paper, combined with soybeans and made into a building material	Combined with sawdust and made into new outdoor decks, garden planters, new plastic bags	Flooring products, adhesive, ground up and used instead of sand in sandboxes	Carpet, fleece clothing, strapping, some beverage bottles



Milli's Safety Tips Safety First!



ALWAYS:

- Perform the activities with adult supervision.
- Read and follow all directions for the activity.
- Read all warning labels on all materials being used.
- Wear eye protection, specifically splash and impact-resistant goggles.
- Follow safety warnings or precautions, such as wearing gloves or tying back long hair.
- Use all materials carefully, following the directions given.
- Be sure to clean up and dispose of materials properly when you are finished with an activity.
- Wash your hands well after every activity.

NEVER eat or drink while conducting an experiment, and be careful to keep all of the materials used away from your mouth, nose, and eyes!

NEVER experiment on your own!

For more detailed information on safety go to chemistry.org/earthday and click on "Safety Guidelines".

The Adventures of Meg A. Mole, Future Chemist

Meg Interviews Bill Carroll, Ph.D.

Dr. C: "Hi Meg! Did you ever imagine that trash could be interesting and entertaining?"

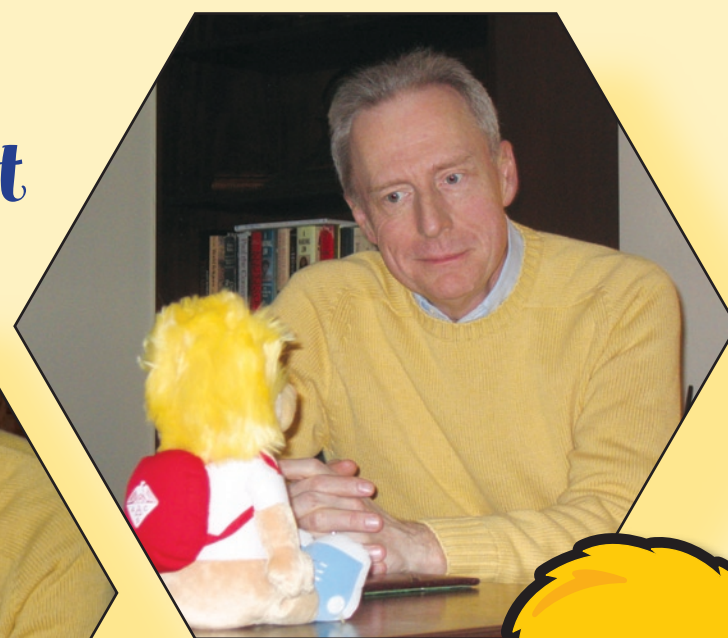
Meg: *Trash?! I had to find out what this chemist was up to!*

THE JOBS OF DR. CARROLL

Dr. Carroll ran a business for five years that recycled plastic bottles. To create this product, he bought garbage from people. He separated out the recyclable plastic, cleaned it, and manufactured new bottles from the recycled plastic. It took him and other scientists about three years to develop the new technology. Working with garbage was a little icky, but it worked. Dr. Carroll was very proud to see bottles on the store shelves made from his company's recycled plastic. These days, he works for a company that makes chlorine. Chlorine helps make water safe to drink. It is also used to make vinyl, a plastic found in pipes, siding and windows. Dr. Carroll also works with officials in the United States and abroad to make laws for environmentally safe chemicals.

HOW HE GOT THERE

Was Dr. Carroll always interested in science growing up? Absolutely! He loved to participate in science fairs. He also had favorite experiments he liked to do, including one where he would use a fizzy chemical reaction to pop a cork out of the top of a bottle. Dr. Carroll was always conscious of wearing safety gear like goggles and gloves to protect him when doing his experiments. He also tried other experiments at home using his brother's chemistry set and store-bought chemicals. Dr. Carroll's mother was a doctor and she encouraged him to conduct biology and medical-type science projects.



To read more about my visit with Dr. Carroll, please visit my web pages at chemistry.org/kids

WHY HE LIKES CHEMISTRY

He really enjoys working with experts from around the world on environmental challenges that matter to everyone. He says he meets the best chemists in the world and also some of the brightest students. He thinks the best thing about being a scientist is "mental exercise." He says, "Science makes you think—it makes you imagine things that could make life better for everyone. Science is about discovery. It's fun to see things that no one has ever seen before or to make things that no one has ever made."

FINAL REMINDER

Next time you take a drink of water, think of Dr. Carroll. Clean, safe water is something that is very rare in parts of the world, and it's the hard work of chemists like him that make our lives better.

Personal Profile: DR. BILL CARROLL

What is your favorite food?

A good chicken sandwich with everything including jalapenos.

What is your favorite color?

ACS colors, of course—Blue and yellow!

What is your birthday?

January 25 in the Gregorian calendar, but I was born when they were still using the Julian calendar!

What is your favorite pastime?

Golf!

Can you tell me a little bit about your family?

My wife Mary is a financial analyst; daughter Allison is 25 and works in Washington, DC; son Will is 20 at Boston College; son Quin is 11 in the sixth grade.

What were your favorite subjects in school?

Chemistry (of course), math, history, speech, and drama.

What is an accomplishment of which you are proud?

Nothing beats my time as ACS President!



Recycling is as Easy as 1, 2, 3...

Take a moment to look at an aluminum can or a plastic bottle. Can you find the universal recycling symbol? Is there anything else besides the symbol? Is there a number or some letters? This issue of *Celebrating Chemistry* will tell you what they mean!

If you would like to learn more about the Möbius Strip visit: <http://pbskids.org/zoom/activities/phenom/mobiusstrip.html>

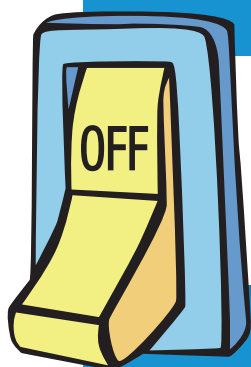
The universal recycling symbol is used worldwide to mark both items that you can recycle and those that someone has recycled already. And as the endless cycle of arrows shows, chances are you can recycle the recycled products again too!

The symbol was created in 1970 through a nationwide design contest sponsored by the Container Corporation of America, a large producer of recycled paperboard. Gary Dean Anderson, a student at the University of Southern California in Los Angeles, submitted the winning entry. Anderson's design was based on the Möbius Strip, three arrows chasing each other around a triangle.

A Möbius strip is an unending loop developed by the 19th-century German mathematician August Ferdinand Möbius. He discovered that a strip of paper twisted once over and joined at the tips formed a continuous, single-edged, one-sided surface. Anderson wanted to design a symbol that showed materials can be used over and over again. Over time, each segment has come to stand for one of the steps in recycling:

1. Collecting recyclable materials,
2. Manufacturing recycled goods, and
3. Buying recycled products.

WHAT CAN YOU DO?

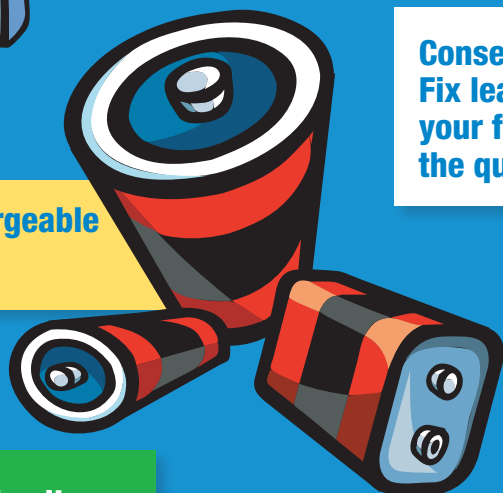


Save energy by turning off lights when you leave a room and replace the light bulbs in your house with energy-efficient bulbs.



Conserve water. Fix leaky faucets and challenge your family to see who can be the quickest in the shower.

Use rechargeable batteries.



Choose products without extra, wasteful packaging.



Wrap gifts in reusable cloth gift bags instead of wrapping paper.

Teach your family and friends what you have learned about reusing and recycling materials in this issue of *Celebrating Chemistry*.

Take your own bags with you to the store, or if you buy only one or two items, carry them out in your hands.



WORDS TO KNOW

Backyard composting – collecting leftover kitchen scraps and yard trimmings for a controlled compost pile

Biodegradable – something that decomposes or breaks down naturally

Compost – crumbly material, like soil (made of leaves/yard trimmings and food scraps) often used in home gardens to improve the soil

Environment – everything that surrounds a living creature and affects it

Green chemistry – movement within the chemical industry to make chemicals in a safer and more environmentally friendly way

Nonrenewable resource – something that has a limited supply or takes thousands of years to regenerate, like fossil fuels, topsoil and precious metals

Polymer – tiny chemical units that are hooked together to form very long chains. “Poly” means many and “mer” means part. Together, the word polymer means “many parts”. Plastic is an example of a polymer.

Recyclable – material that still has useful physical and chemical properties after its original purpose has been served and can be reused or made into new products.

Recycle – collect unwanted materials and process them to make new materials

Reduce – limit the amount thrown away by buying items that can be used more than once, making your own things and choosing items with less packaging

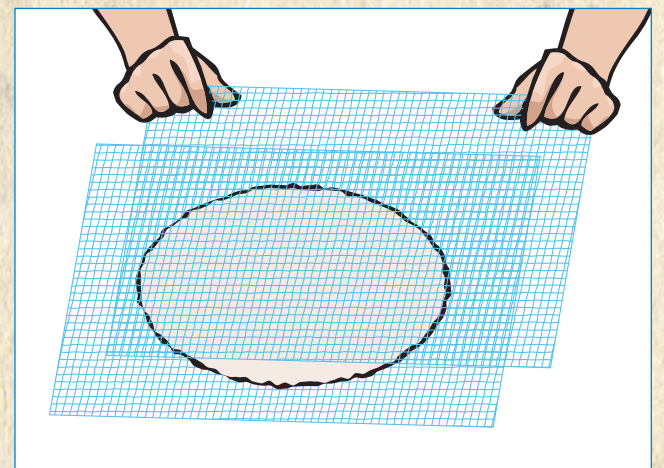
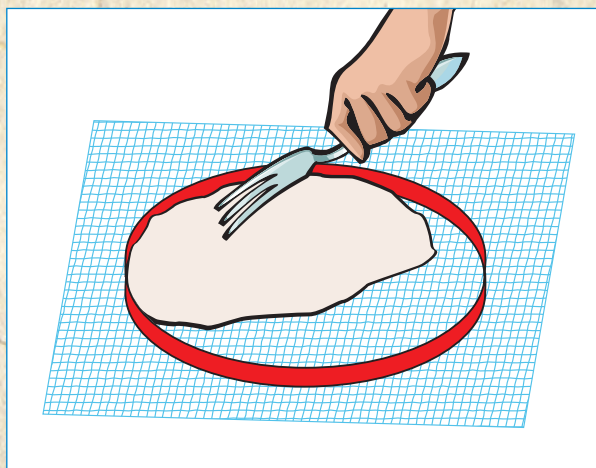
Reuse – find a new way to use something again

Making Recycled Paper

Did you ever wonder where paper comes from? Paper is usually made from trees. Every year, people in the United States use approximately 340 kilograms (750 pounds) of paper each! To produce that much paper, a 30.5-meter (100-foot) tall tree would have to be cut down for each person. Luckily, about 57% of the paper used in the United States today is recycled. (Source: Georgia Pacific) Almost all paper can be recycled today, but some types are easier to recycle than others. Recycling saves resources and energy. To recycle your own paper, follow the simple steps below.

Materials

- Newspaper
- Blunt-end scissors
- Metric ruler
- Bowl
- Measuring cup
- Water
- Blender or food processor (optional with adult supervision)
- Disposable plastic fork
- Rolling pin
- 2 pieces of nylon screen (30 centimeters, or 1 foot square each)
- Plastic needlework frame (15 centimeters, or 6 inch round)
- Hairdryer (optional)



SAFETY! *Be sure to follow Milli's Safety Tips and do this activity with an adult! Do not eat or drink any of the materials used in this activity. An adult must do all the steps involving the blender or food processor.*

Procedure

1. Cut a piece of newspaper that is 30 centimeters (12 inches) wide and 40 centimeters (15 inches) long.
2. Rip the paper into small pieces that are about 1 centimeter (1/2 inch) square, and place the pieces into a bowl.
3. Add 1/2 cup water to the bowl and set it aside for two days. *(Alternatively, you can add the water and paper to a blender or food processor. An adult must complete all steps involving the blender or food processor! After the lid has been fastened securely onto the appliance, the water mixture should be blended on medium speed for five minutes. Skip to step 5.)*
4. Using a plastic fork, mix the paper with the water until the paper disintegrates into pulp.
5. Stretch one piece of the nylon screen and clip it into the needlework frame.
6. Using the plastic fork, strain the pulp and drop it onto the nylon screen in the needlework frame. Then spread the pulp evenly across the surface of the screen.
7. Carefully, remove the nylon screen from the frame and place it pulp side up onto a pile of newspaper.
8. Place the second piece of nylon screen over the pulp, so that you make a sandwich with screen on top and bottom and the pulp in the middle.
9. Use the rolling pin to squeeze all the water you can from the pulp by rolling it over the top of the nylon screens.
10. Without removing the screens, move your newly formed paper to a dry spot, and allow it to dry overnight. *(Alternatively, you can dry the paper using a hair dryer. An adult must perform this step.)*
11. Remove the paper from the nylon screens.



12. Pour the liquids down the drain, recycle any unused paper, and throw what your adult lab partner says cannot be reused or recycled in the trash. Thoroughly clean your work area, and wash your hands.

Try this...

Make a second batch of recycled paper, adding in a few pieces of colored paper, yarn, or string to the newspaper. You can also add small pieces of leaves to change the texture of the paper.

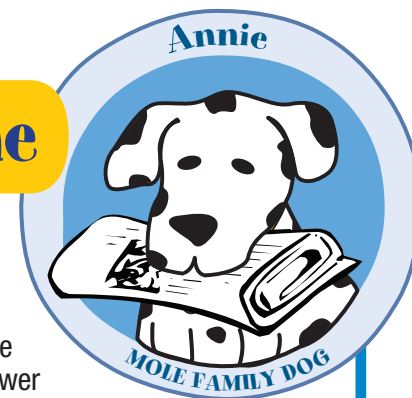


What Did You Observe?

What does your paper look like?
Is it white? Why not?

Lined notebook paper for writing observations.

Annie's Matching Game



Complete the statement on the left by matching it with a number from the left.

- 220
- 60%
- 1/3
- 4
- 240
- 5
- 7,500 to 10,000
- 22
- 3
- 63,000

- A. The energy saved by recycling one aluminum can, can be used to power a TV for _____ hours.
- B. In the United States we throw away enough plastic soda bottles to circle the Earth _____ times.
- C. Of the plastic bottles that are thrown away, _____ of them are recycled.
- D. When we make new paper from old paper, we use _____ less energy than making it by cutting down trees.
- E. Each day in the United States, we throw away enough trash to fill _____ garbage trucks.
- F. An incandescent light bulb will last about 750 hours, compared to _____ hours for a compact fluorescent bulb that makes the same light.
- G. During the holidays _____ million extra tons of waste is generated.
- H. More than _____ million tires are discarded in the United States each year.
- I. Twenty percent of the material sent to landfills in the United States is plastic. An average person in the United States goes through _____ pounds of plastic each year.
- J. In Latin America, each person accounts for only _____ pounds of plastic each year.

Answers at bottom of page

You Can Be a Chemist

Chemistry is the science that helps us learn about the world around us. Everything is made of chemicals—our bodies, our pets, our houses, the toys we play with, the medicines we take, the food we eat, and the books we read. Chemicals are the ingredients that make up all living and non-living things.

Chemists are scientists. Many of them work in laboratories to solve problems and make new materials. Laboratory chemists are often inventors. They combine chemicals in ways that no one else has done before. Chemists have discovered the adhesive used on Post-it notes, artificial sweeteners, Teflon, Nylon, new medicines, and many different kinds of plastics.

Some chemists are teachers. They help students learn about the world around them. Some chemists work for toy companies looking for more ways to keep children around the

world entertained. Other chemists are lawyers or writers for newspapers and magazines. Because chemistry is part of everything, chemists work in many different fields and have a wide variety of jobs.

If you want to learn more about chemistry, watch your newspaper for notices about programs for K–12 students. Local colleges frequently sponsor programs for students with an interest in science. Your school guidance counselor or science teacher can also talk to you about these programs as well as some possible careers in chemistry. The work of chemists will never be over. As long as we need new products, better ways to protect the environment, and more information about the world and the way it works, there will be a need for chemists.

For articles and other information about chemistry, check out the website, chemistry.org/kids.

Where's the Chemistry?

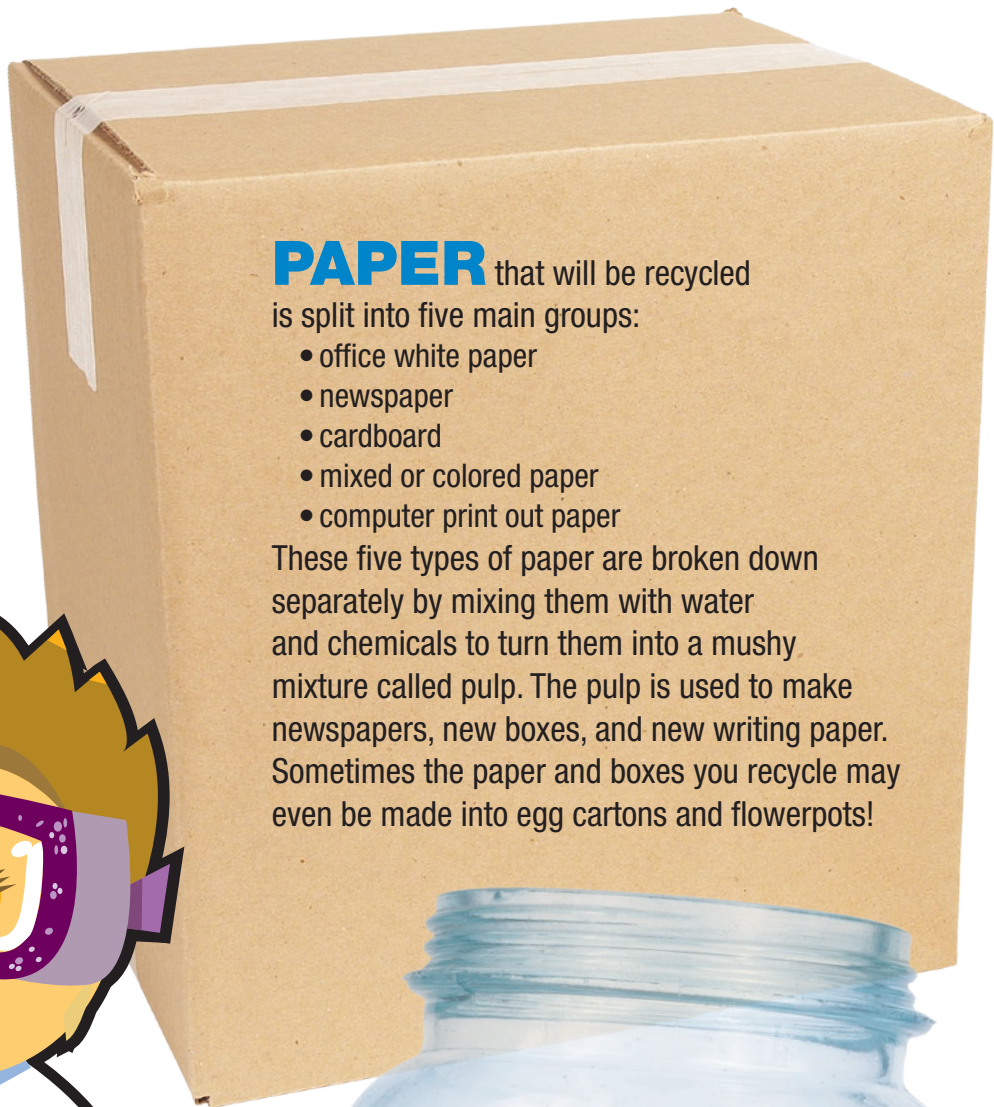
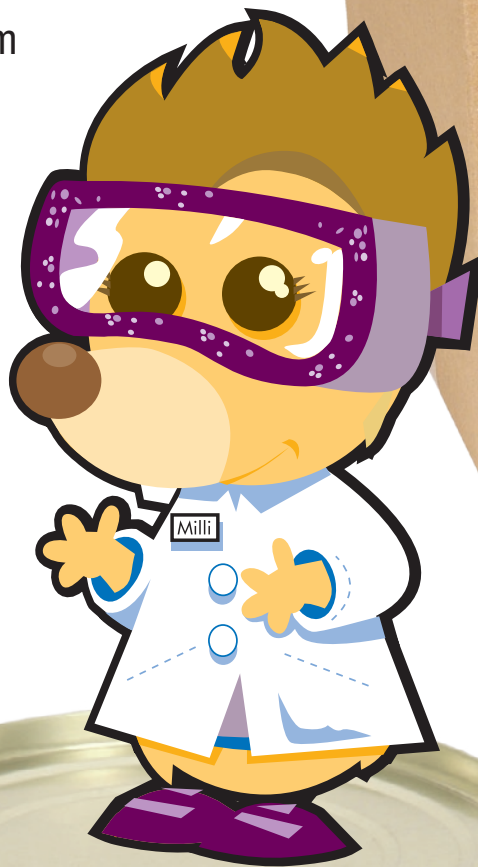
Plants use the energy of the sun to make all sorts of chemicals like sugars, simple carbohydrates, and more complex ones, such as cellulose. Cellulose is the main ingredient in wood pulp. Plants use tough, fibrous cellulose to make their limbs and trunks strong and stiff. Cellulose can be made into many different products like paper, cardboard, rayon fabric, and insulation. By recycling paper we cut down on the amount of waste in our landfills, save trees, and conserve energy.



Milli Recycles & You Can, Too!

Recycling centers process the materials you place in your recycling bin and turn them back into products we can use again. Each kind of material requires a different process.

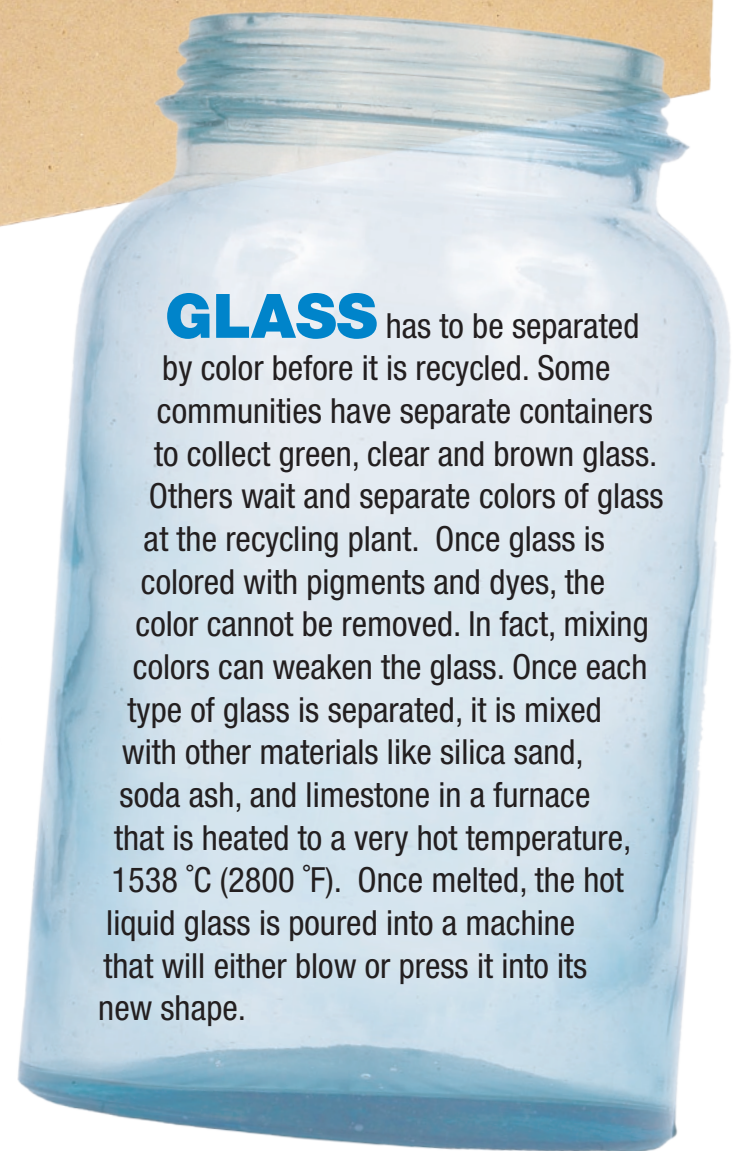
For example, a recycling center may start by melting plastic jugs after cleaning them, by shredding aluminum cans, crushing glass bottles, or adding water to old newspaper until it turns into a pulpy soup. So to make recycling more efficient, Milli's hometown provides containers so she can separate her recyclables right at home. Does yours? If not, your town's website may list stores or collection centers that accept recyclables.



PAPER that will be recycled is split into five main groups:

- office white paper
- newspaper
- cardboard
- mixed or colored paper
- computer print out paper

These five types of paper are broken down separately by mixing them with water and chemicals to turn them into a mushy mixture called pulp. The pulp is used to make newspapers, new boxes, and new writing paper. Sometimes the paper and boxes you recycle may even be made into egg cartons and flowerpots!



GLASS has to be separated by color before it is recycled. Some communities have separate containers to collect green, clear and brown glass. Others wait and separate colors of glass at the recycling plant. Once glass is colored with pigments and dyes, the color cannot be removed. In fact, mixing colors can weaken the glass. Once each type of glass is separated, it is mixed with other materials like silica sand, soda ash, and limestone in a furnace that is heated to a very hot temperature, 1538 °C (2800 °F). Once melted, the hot liquid glass is poured into a machine that will either blow or press it into its new shape.



Look at the bottom of a **PLASTIC** bottle. Do you see a little number inside a triangle of arrows? That is the plastic resin identification code. There are seven different codes and each stands for a different type of plastic. A growing number of communities are collecting all plastics to recycle, but most still limit the types—usually those with a #1 or #2 code. Milk jugs, drink bottles, containers for shampoo or laundry detergent, and various food jars are examples of commonly recyclable plastics. When the resin identification code is hard to find, Milli follows a simple rule called "check the neck". If the lid screws on the top, and the neck is smaller than or the same size as the base, then the plastic container should go in the recycling bin. Recycling plants separate plastics by resin identification codes before cleaning and processing them into new, recycled plastic materials.

METALS are separated by type, such as iron/steel, aluminum, copper, lead, and zinc. They are separated because each kind of metal is used to make different products, and they melt at very different temperatures. Iron/steel and aluminum are the most recycled metals because they are widely used to make food cans like those for vegetables and some drinks. Digging the ore out of the ground and making brand new cans and products costs much more than it does to recycle what we have now.

Recycling can seem like extra work compared to just tossing your cans and bottles and papers into the trash. But you can also make it fun! Try and see just how small you can make your bag of trash by reusing and recycling as much as you can. Milli often gives things that she does not want or need any more, such as books and clothes, to someone else rather than throwing them in the trash. Whenever possible, buy products that are made from recycled materials. After a little bit of practice, reusing and recycling will become a habit. And with every item you reuse or recycle, you help make Earth a better place!

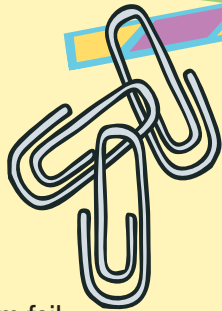
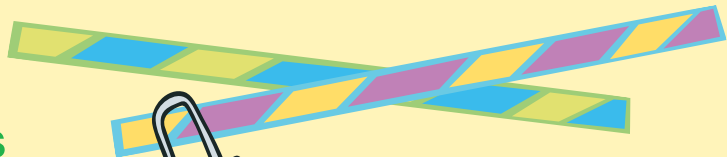


Milli's Super Sorting Challenge

Materials can be grouped or separated by how they look and/or by the material of which they are made. These qualities are called **properties** of the materials. Some recyclers use special properties of materials to group recyclables. In this activity, you will separate materials based on their special properties.

Materials

- Plastic straw
- Blunt-end scissors
- Metric ruler
- 1 latex balloon
- 1 square of aluminum foil (5 x 5 centimeters) (about 2 inches square)
- 1 square of paper towel (5 x 5 centimeters) (about 2 inches square)



- 5 metal paper clips (small ones about 3 centimeters; about 1 inch in length)
- 1 piece of window screening (20 x 30 centimeters) (about 8 x 12 inches)
- Rectangular cake pan (about 32 x 23 x 5 centimeters) (9 x 12 inches)



NOTE: A coffee stirrer could be used in place of a drinking straw.

ADAPTATION

The activity could be conducted first separating just two materials and then adding the others. Also, larger pieces of the aluminum foil and the paper towel could be used.

SAFETY!

Be sure to follow Milli's Safety Tips and do this activity with an adult! Do not eat or drink any of the materials used in this activity. An adult must do all the steps involving the blender or food processor.

Procedure

1. Cut the plastic straw into five pieces (any size) using the scissors.
2. Cut or tear the aluminum foil and the paper towel into 5 pieces each (any size).
3. Roll each piece of paper towel into a ball between your thumb and index finger.
4. Place the pieces of straw, aluminum foil, paper towel, and the paper clips together in a pile on the screen.
5. Move the magnet through the pile (you may need to bring it very close to the objects). Put any objects picked up by the magnet aside in a pile. Record the objects picked up in the "What Did You Observe?" section.
6. Inflate the balloon and tie it closed (your adult lab partner may need to help you). Rub the balloon back and forth on your hair. Hold the balloon close to the pile and see what happens to the objects. Put everything that is attracted to the balloon in a second pile. Record these items in the "What Did You Observe?" section.
7. Fill the cake pan with water. Take the screen with the remaining objects on it and dip it into the water so that the screen touches the bottom of the pan. Pick off any floating materials and put them in a third pile. Record these items in the "What Did You Observe?" section.
8. Now lift the screen and put the remaining objects in a fourth pile. Record these items in the "What Did You Observe?" section.
9. Thoroughly clean the work area and wash your hands. Reuse/recycle as many of the materials as possible! Check your reuse/recycle plans with your adult lab partner first.

Try this...

Now try and see if you can separate different materials. On a piece of cardboard, place 4 pennies (metal—copper and zinc), some pencil shavings (wood), four rubber bands (rubber), and three marbles (glass) in one pile. Your job is to figure out a good way to separate them. You may use the following actions or equipment, but not necessarily in this order:

- Use short, gentle bursts of air from your mouth to blow air at the pile.
- Hold a piece of tape (25 centimeters/10 inches long) at one end and lower the other sticky end onto the pile.
- Shake the cardboard back and forth in short fast movements.

Experiment with these methods to figure out in what order to do them so the materials can be separated easily.

	Attracted to Magnet	Attracted to Balloon	Floated on the Water	Did Not Float
Object				

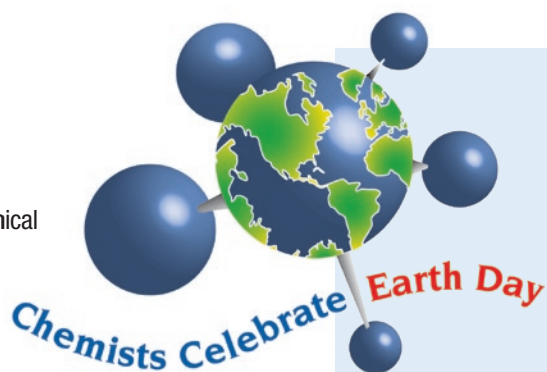
Where's the Chemistry?

Materials have different chemical and physical properties that make them easy to separate. Recycling plants use machines that vibrate to sort paper from wood and cardboard. They use magnets to pull out tin and steel that is mixed with aluminum and plastic. Paper, glass, plastic, and metal each has its own chemical make-up and its own way of being recycled. It is important that each is separated from the other items before recycling. Paper is cut up, bleached and pulped. Some metals can be picked up by magnets and other metals cannot. Some materials are attracted to each other because of static electricity, which involves positive and negative charges. The hollow plastic straw pieces float because they spread their weight out and can float on the water's "skin." This skin forms because water tends to stick to itself, which is called cohesion. Materials with properties that are alike get cleaned, cut up, melted down and then made into new products. Some recycling plants are starting to use these different properties to help them sort out materials. They make machines to separate out recyclable materials just like you did but their process is on bigger scale!



Celebrating Chemistry

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Meg A. Mole's interview was written by Kara Jackson.

Content for the recyclable materials article was contributed by Sonja Williams and the American Chemistry Council.

The activities described in this publication are intended for elementary school children under the direct supervision of adults. The American Chemical Society cannot be responsible for any accidents or injuries that may result from conducting the activities without proper supervision, from not specifically following directions, or from ignoring the cautions contained in the text.



PRINTED ON RECYCLED PAPER WITH SOY-BASED INK.

Green Grass, Green Leaves, Green Beans, Green Thumb... but Green Chemistry??

What is green chemistry? You might think green chemistry is the chemistry of green things.

Maybe it refers to photosynthesis—the process that only green plants carry out. Maybe it means mixing green liquids together. Or perhaps it means using chemistry to make green things—green paint, green paper, green jellybeans, etc...

Actually, green chemistry is the movement within the chemical industry to make chemicals in a safer and more environmentally friendly way. To accomplish this, chemists are inventing new chemicals that are safer but have the same beneficial properties as existing chemicals. For example, chemists have developed new insecticides that kill some insects, yet are safe for plants, other insects, and other animals including human beings.

Sometimes, however, the process used to make a chemical also makes some other chemicals or “byproducts” that may be dangerous. Another way that chemists use green chemistry is to change the way a chemical is made. They use some different “ingredients” so that harmful chemicals are not made. Water, for example, is used in place of other chemicals whenever possible. In some cases, the whole “recipe” for making a chemical may be changed. This way, both the ingredients and the step-by-step process make safer chemicals and fewer byproducts. For example, ibuprofen, the drug in some painkillers like Advil or Motrin, was first made using a difficult process that gave scientists large amounts of byproducts. Now, chemists make ibuprofen in a new way that results in fewer byproducts.

These changes in how chemicals are made is a new way to protect human beings and the environment.

It is better not to make harmful substances in the first place than it is to treat or clean up these substances and the problems they create. This is what green chemistry is all about.

What is the American Chemical Society?

The American Chemical Society (ACS) is the largest scientific organization in the world. ACS members are mostly chemists, chemical engineers, and other professionals who work in chemistry or chemistry-related jobs. The ACS has more than 160,000 members. The majority of ACS members live in the United States, but others live in different countries around the world. Members of the ACS share ideas with each other and learn about important discoveries in chemistry during meetings that the ACS holds around the United States several times a year, through the use of the ACS website, and through the journals the ACS publishes.

The members of the ACS carry out many programs that help the public learn about chemistry. One of these programs is Chemists Celebrate Earth Day, held annually April 22. Another of these programs is National Chemistry Week, held annually the fourth week in October and celebrating its 20th anniversary in 2007. ACS members celebrate by holding events in schools, shopping malls, libraries, science museums, and even train stations! Activities at these events include carrying out chemistry investigations and participating in contests and games. If you would like more information about these programs, please contact us!



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